

# Openness to Experience

Robert R. McCrae and David M. Greenberg

*Some fisherman whose line jerks with his catch,  
some idle shepherd leaning on his crook,  
some plowman at his plow, looks up and sees  
something astonishing ...*

(“Daedalus and Icarus,” Ovid, *Metamorphoses*, C. Martin, Trans.)

After a single hearing, the 14-year-old Mozart transcribed Allegri’s *Miserere* – 12 minutes of music for nine voices – from memory. In his seventies, and totally blind, Euler composed and dictated dozens of major works of mathematics. Mozart and Euler are indisputably geniuses of the first magnitude, but not simply because they possessed seemingly magical mental abilities. After all, Luria (1968) documented the case of a Russian journalist who could remember virtually everything (including tables of random numbers seen decades ago) but who never produced work of any consequence. A number of autistic individuals – so-called *savants* – can perform prodigious feats of calculation, although they never advance mathematics. Geniuses usually have exceptional gifts, but their defining characteristic is that they use these gifts to solve artistic, intellectual, or practical problems in original ways. What is it beyond mere mental ability that leads these individuals to see the world with a fresh perspective? In this chapter, we consider the hypothesis that genius is due in some measure to personality traits, and in particular to a group of traits that define Openness to Experience.

The idea that genius is tied to distinctive traits is old and widespread. In particular, since antiquity it has been asserted that genius is akin to madness, and Eysenck (1993) revived this idea by arguing that creative geniuses are high in Psychoticism, a general personality trait supposed to be a predisposing factor for psychosis.<sup>1</sup> Jamison (1996) presented the case that artists are particularly prone to bipolar disorder. The evidence for a link between genius and mental disorder is mixed (Waddell, 1998), but suggests the hypothesis that genius may be related to personality traits in the domain of Neuroticism. A quite different set of traits was identified by Cox (1926) in a pioneering study of character in geniuses. She reported that early in life they were distinguished by (among other things) tenacity of purpose, perseverance in the face of obstacles, and a desire to excel. Simonton (2000) similarly mentioned ambition as a common characteristic of highly creative persons. These are characteristics contemporary psychologists would call aspects of Conscientiousness. Our focus in this chapter will be on a third domain of personality traits, Openness to Experience.

## Openness and Personality Structure

Although there are thousands of words to describe traits – like *nervous*, *exuberant*, *original*, *altruistic*, and *careful* – and hundreds of trait scales developed by psychologists, psychologists have come to understand that virtually all of them can be organized in terms of five very broad factors. This organization is called the Five-Factor Model (FFM; Digman, 1990; Markon, Krueger, & Watson, 2005), and the factors are usually labeled Neuroticism (vs. Emotional Stability), Extraversion (vs. Introversion), Openness (vs. Closedness) to Experience, Agreeableness (vs. Antagonism), and Conscientiousness. Each of these factors is defined by a group of traits that covary. For example, people who are nervous also tend to be irritable, melancholy, bashful, impulse-driven, and fragile; together, these traits define the factor of Neuroticism.

Personality traits and factors have bell-shaped distributions, which means that a few individuals are very high on the trait, a few are very low, and most are near average. Although it is convenient to speak of extraverts versus introverts, in fact most people have some extraverted and some introverted features and are most accurately described as ambiverts. Openness, too, is a continuous dimension, and our claim is that, at least in this respect, genius is not qualitatively distinct. All of us share, in some degree, the quality of mind that lifts a few to greatness.

*Extraversion* is a psychological term that has passed into common usage, and the essence of Agreeableness is known to every child who can distinguish *nice* people from *mean* people. Openness, however, is a less familiar concept, both to laypersons and to professionals. Compared with the rich vocabulary for describing forms of Extraversion or shades of Agreeableness, there are relatively few specific words in English for traits related to Openness. For example, some people are more responsive to art and beauty than others, but there is no single adjective in English to express aesthetic sensitivity (McCrae, 1990). Openness is understandable to laypersons, but it is not conveniently coded in language. For their part, psychologists have proposed many constructs related to Openness versus Closedness – including dogmatism, tolerance for ambiguity, rigidity/flexibility, psychological mindedness, sensation/intuition, alexithymia, loose boundaries, and fantasy-proneness – but until recently, few realized that all these concepts were somehow related. It was not until the 1980s that the notion of a single broad factor that encompassed all these traits was clearly articulated (McCrae & Costa, 1985b).

As its name suggests, Openness to Experience characterizes people who are willing – often eager – to encounter a wide variety of ideas, feelings, and activities. In the NEO Inventories (McCrae & Costa, 2010), a widely used measure of the FFM, Openness is assessed through six traits, or facets: Openness to Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values. Prototypically open people are imaginative and appreciative of art and beauty, and have rich and deep emotional reactions. They readily adopt new ways of doing things, have wide intellectual interests, and tend to be socially and politically liberal. Although these six facets covary to define a single factor, they are not interchangeable: People vary in the particular aspects of experience to which they are open or closed.

Most psychologists are themselves open, and they tend to value traits at the positive pole of this factor. But closed people disagree with that assessment, and are pleased and proud to be practical, down to earth, and traditional. Neither Openness nor Closedness is associated with mental health or happiness; neither is better or worse: They

are simply different ways of approaching the world. They are not, however, equally conducive to the kinds of achievements that we designate as genius. Even with great mental abilities, an individual who had little curiosity and was most comfortable with conventional behavior would be unlikely to make revolutionary contributions to the arts or sciences.<sup>2</sup>

## Properties of Openness

Once the FFM structure of personality was understood, it was relatively easy to conduct systematic research on the properties of traits. All five factors have shown consistent evidence of observability, universality, stability, and heritability.

### Observability

One of the most important features of traits is that they are in a crucial sense *observable*. Traits are highly abstract dispositions, and they cannot be measured as easily or objectively as height or weight. Instead, personality trait assessment relies on the inferences of human judges who are well acquainted with the target person. These judgments are quantified by asking informants to respond to a standardized set of items in a personality scale (e.g., “Poetry has little or no effect on him,” an item assessing Openness to Aesthetics). When the ratings of different judges are compared, it is clear that there is general, though not perfect, agreement; traits can be consensually validated (McCrae, 1982). Further, this consensus is also shared by the individuals who are rated: Their self-reports generally agree with informant ratings. For example, in a study of 275 adult men and women, self-reports of the five factors correlated with mean ratings of from one to four peers,  $r_s = .30$  to  $.57$ ,  $p < .001$  (McCrae & Costa, 1987).

It is perhaps not surprising that judges can agree on who is an introvert and who is an extravert: A laughing, glad-handing people-person is easily distinguished from a somber loner. But people can also gauge the Openness of those they know well. Although experiential openness may seem like an internal trait, a feature of consciousness that only the individuals themselves could perceive, in fact Openness manifests itself quite clearly in people’s behavior and in their conversation (McCrae & Sutin, 2009). Open people attend museums, display bumper stickers promoting liberal causes, and analyze their feelings with their intimates. One of the telltale signs of Openness is the experience of chills – a tingle down the spine – in response to certain passages in music or striking beauty in poetry or art. Yet even this very private experience is perceived by others who know the individual well (McCrae, 2007).

The practical implication of this fact, important for the study of genius, is that psychologists have two different ways of assessing Openness – self-reports and observer ratings – that are more or less interchangeable. We can no longer ask Martha Graham or Bruce Lee to complete a personality inventory, but we can ask their biographers to do so with some confidence that we will get basically similar results.

### Universality

For most of the 20th century, psychologists believed that personality was the product of social experience – that it emerged as individuals internalized the language

and customs of their culture. Consequently, it was plausible to argue that personality traits, and their organization into personality structures like the FFM, would vary greatly across different cultures (Juni, 1996). With the advent of email and the development of professional training for psychologists around the world, that became an easily testable hypothesis: Assemble an international collaboration of psychologists and let them translate personality inventories into different languages and administer them to samples in their own cultures. Analyses of the results could then be readily compared across cultures (e.g., Schmitt *et al.*, 2007).

Such studies – in cultures as diverse as Chile, Iceland, the UK, Kuwait, and South Korea – quickly established that the FFM structure of personality is in fact universal (McCrae & Costa, 1997b). In every society there are conscientious people and lazy people, charitable and stingy people, assertive and submissive people. The evidence is strongest in developed, Western nations such as Germany and Canada; it is weakest in Sub-Saharan African nations, although even there the American structure can be clearly replicated if very large samples are used (McCrae, Terracciano, & 78 Members, 2005).<sup>3</sup>

Some factors are more easily replicated than others, and it is perhaps not surprising that Openness, the most abstract of the five, is the most difficult. For example, in Shona, a language of Zimbabwe, only three of the facets (Openness to Aesthetics, Ideas, and Values) are clear definers of the Openness factor. De Raad and Szirmák (1994) found no Openness factor in the Hungarian trait lexicon (although an Openness factor clearly emerges when the NEO Inventory is administered in Hungarian; McCrae, 2005). Cheung and colleagues (2008) argued that the concept of Openness might not be indigenous to Chinese culture, because they had not found an Openness factor in their earlier research developing the Chinese Personality Assessment Inventory (CPAI; Cheung *et al.*, 1996). They therefore scoured the Chinese research literature, interviewed Hong Kong and Mainland Chinese informants about concepts related to Openness (e.g., *kaiming*, *kaitong*, *kaifang*), and convened focus groups to elicit examples of open people and behaviors. From these sources, they generated a pool of items to tap Chinese manifestations of Openness, organized into six facets – Novelty, Diversity, Divergent Thinking, Aesthetics, Interpersonal Tolerance, and Social Sensitivity – and administered them to large Chinese samples. In a joint analysis with scales of the CPAI and NEO Inventories, a clear Openness factor emerged, with strong loadings from the indigenous Chinese scales of Diversity, Novelty, Divergent Thinking, and Aesthetics as well as the “Western” Openness scales. It appears that Openness actually is a central part of Chinese personality, although apparently not an obvious one.

If Openness is found across such a wide range of cultures, it seems likely that it also has endured throughout human history. Psychologically speaking, Elizabethan England is surely no more different from the present-day UK than the UK is from Kuwait or South Korea. Openness in Shakespeare (1564–1616), Omar Khayyám (1048–1131), or Sappho (620–570 BCE) probably looked very much as it does today.

### Stability and developmental course

Versions of the FFM can be found in children as young as five (Measelle, John, Ablow, Cowan, & Cowan, 2005), but most research has focused on adolescents and adults. Like the other factors, individual differences in Openness change more in adolescence

than in adulthood, but after age 30 they are highly stable. Terracciano, Costa, and McCrae (2006), for example, reported that the correlation of Openness scores on two occasions 10 years apart in a sample of 676 men and women initially aged 30–89 was  $r = .85$ . People who are high in Openness remain high, and those who are low remain low for most of their lives – despite such life events as marriage, having children, retirement, or bereavement. To the extent that Openness contributes to it, we would expect that genius would continue for a lifetime. Although a few geniuses, like Walt Whitman, do not show signs of their extraordinary gifts until midlife, a lifelong career of creative accomplishments is in fact the rule (Simonton, 1988).

The stability of individual differences does not preclude change in absolute levels; a group of people may increase or decrease uniformly on a trait and thus maintain their relative level. Both cross-sectional and longitudinal studies of Openness show that it rises in adolescence, peaking in the decade of the twenties. Then, after a decline into the thirties, it remains generally stable for most of adulthood (McCrae, Martin, & Costa, 2005). The changes that are seen are relatively small; age accounts for only about 5% of the variance in Openness scores across the full adult lifespan. When the individual Openness facets are examined, a more differentiated picture appears. In one study (Terracciano, McCrae, Brant, & Costa, 2005), Openness to Values, Feelings, and Actions accounted for most of the decline in overall Openness; Openness to Aesthetics and Ideas, presumably the traits most relevant to artistic and intellectual genius, showed very little decline across the adult lifespan.

Psychologists were once concerned that cross-sectional age differences in traits reflected birth cohort effects: Today's older generation grew up in a different world than today's young people, and any differences in personality traits might be due to those different early life experiences, rather than to the natural course of aging. If this were the case, we would expect that generational differences would vary across cultures, because different societies have had different recent histories. The older Chinese generation lived through Mao's disastrous Great Leap Forward, while their contemporaries in America prospered under the Eisenhower and Kennedy administrations. One might expect scars from this traumatic experience to shape the traits of older Chinese – they might, for example, have become extremely rigid and closed to new, and potentially frightening, experiences. And yet, compared with today's younger Chinese, older Chinese look very much like older Americans (compared with younger Americans; Yang, McCrae, & Costa, 1998). In fact, age differences look very similar all around the world (McCrae, Terracciano, *et al.*, 2005), and thus almost certainly reflect intrinsic maturational processes that are relatively untouched by social history.

### Heritability

If the structure of Openness is unaffected by culture, if individuals persist at their own characteristic level of Openness despite the vicissitudes of life, if history has no impact on the character of a generation, then one begins to suspect that Openness – and the other traits of the FFM – are biologically based (McCrae *et al.*, 2000). Consistent with this view is a wealth of evidence that traits, including Openness and its facets, are strongly heritable. In an analysis combining data from 9,461 respondents from Canada, Germany, Japan, and Italy (McCrae, Kurtz, Yamagata, & Terracciano, 2011), the estimated heritability of Openness – the proportion of the variance in the population due to genetic effects – was .57, and ranged from .45 to .53 for the six

Openness facets. Openness to Aesthetics and Ideas were in fact the most heritable of the 30 traits measured by the NEO Inventories. Genius, too, is highly heritable, as first documented by Sir Francis Galton (1869) in his pioneering study, *Hereditary Genius*.

This does not mean that people's experiences are unimportant: They are crucial for shaping the expression of underlying personality traits (McCrae & Costa, 2008). Every healthy child is born with the innate capacity for human speech, but the language a child acquires is determined completely by its environment. In the same way, the specific manifestations of Openness are a product of one's time and culture. Openness to Fantasy, for example, is always seen in vivid and elaborate imaginings, but open individuals in the Middle Ages did not dream about voyaging into a Black Hole via science-fiction quantum mechanics; like Dante, they were more likely to imagine a descent into Hell. This principle also applies to genius. Giotto could never have painted Raphael's *School of Athens*, because it requires techniques of perspective that had not yet been invented – and Giotto could hardly have conceived of decorating the Pope's quarters with a celebration of pagan thinkers.

Although the underlying personality trait of Openness is strongly heritable, much of the variance in Openness remains unaccounted for by genes. However, psychologists do not as yet understand the remaining sources. We do know, however, that the shared environment – experiences that are similar for all the children in a family, such as diet, parental role models, religious training, local schools, and neighborhoods – has little or no effect. For example, as adults, biologically unrelated adoptive siblings show virtually no resemblance in Openness (Loehlin, 1992), despite having grown up in the same household. The essayist Montaigne was raised with the greatest care and delicacy, awakened each morning by serenading musicians in a curious anticipation of the current fad of playing Mozart to enhance child development – but it is likely that he would have become a literary giant even without that parental intervention.

A few attempts have been made to alter levels of Openness experimentally. Jackson, Hill, Payne, Roberts, and Stine-Marrow (2012) taught inductive reasoning to older adults for 16 weeks and asked them to work on crossword and Sudoku puzzles. At the end of the training, the group scored modestly higher (about one-quarter standard deviation) on measures of Openness to Ideas. MacLean, Johnson, and Griffiths (2011) showed that mystical experiences induced by an experimentally administered dose of the “magic mushroom” drug, psilocybin, led to increases (about one-half standard deviation) in Openness and its Fantasy, Aesthetics, Feelings, and Ideas facets that were sustained for at least one year.

In Ancient Athens, a place that produced more than its share of geniuses, most citizens were initiated into the Eleusinian Mysteries, and some historians have speculated that this ritual included the use of hallucinogenic mushrooms (Wasson, Ruck, & Hofmann, 1978). Is it possible that the intellectual insights, political innovations, and artistic masterpieces that lie at the foundation of Western civilization may have been due, in part, to mushroom-induced elevations of Openness to Experience?

### Conceptualizing Openness

To conduct research on its stability or heritability, one only needs the operational definition of Openness as “what Openness scales measure.” But to understand clearly the implications of Openness for a topic like genius, one must have a deeper

conceptualization. What is the psychological essence of Openness? Some progress has been made in grasping its nature.

One early view was that Openness was a cognitive capacity, like spatial ability or verbal intelligence. If one looks only at the English language adjectives relevant to this factor – words like *perceptive*, *analytical*, *curious*, and *intelligent* – it is easy to see why lexical researchers called the factor *Intellect*, and argued that it described people who are “*smart* or *dumb*” (Goldberg, 1981, p. 161). Indeed, Dimitrijević (2012) has shown that intellectually gifted students in Serbia consistently score higher on Openness to Fantasy, Aesthetics, and Ideas. But most research relating Openness to cognitive abilities has found only modest overlap. For example, in the Baltimore Longitudinal Study of Aging (Shock *et al.*, 1984), the correlation of the NEO Openness factor with WAIS Vocabulary was only  $r = .20$  (McCrae, 1987). Nofle and Robins (2007) used several different measures of Openness and found correlations of .20 to .26 with Scholastic Aptitude Test (SAT) Verbal scores, but only .02 to .05 with SAT Math. They also reported that Openness was essentially unrelated to GPA in either high school or college (*Mdn*  $r = .05$ ).<sup>4</sup> Clearly, Openness is not equivalent to general intelligence, and the term *Intellect* has generally fallen into disuse.

However, other aspects of cognitive ability may be more closely related to Openness. There is a small correlation ( $r = .25$ ) with emotional intelligence assessed as an ability (Brackett & Mayer, 2003). More substantial are correlations with measures of *divergent thinking*, the ability to generate multiple solutions to a problem (e.g., possible uses for a brick). McCrae (1987) showed that both self-reports and informant ratings of Openness were associated with a measure of divergent thinking,  $r \approx .40$ , and these associations remained significant after controlling for age, years of education, and vocabulary scores. Open individuals named more remote or unusual consequences of a hypothetical event; they generated more sentences from a given set of initial letters (e.g., A C E G: “All cows eat grass” or “Andrew Carnegie exited gracefully”). In contrast, Neuroticism, Extraversion, Agreeableness, and Conscientiousness were essentially unrelated to divergent thinking scores.

Divergent thinking is a particularly important correlate of Openness because it is the ability most closely associated with creativity (Barron & Harrington, 1981). For example, women who scored higher on measures of divergent thinking also wrote stories that were judged by English professors to show originality and creativity (Alpaugh, Parham, Cole, & Birren, 1982). If divergent thinking is associated with Openness, creativity may also be.

Evidence for that hypothesis comes chiefly from studies that have examined the personality traits of individuals known to be creative. In one of the largest of these studies, Gough (1979) assembled data on 1,701 individuals who had been rated on creativity in a number of different fields. Gough correlated these ratings with endorsements of trait adjectives and identified 30 items that predicted creative achievement, including *clever*, *inventive*, *reflective*, and *unconventional* versus *commonplace*, *conservative*, and *interests narrow*. When combined into a Creative Personality Scale, these traits were correlated with both total divergent thinking ( $r = .26$ ) and Openness as assessed by NEO Inventory self-reports ( $r = .44$ ) and peer ratings ( $r = .34$ ; McCrae, 1987).

King, Walker, and Broyles (1996) assessed Openness, creative ability (from a divergent thinking test), and creative achievements (from a list of life accomplishments, such as acting or inventing a new recipe). They showed that both Openness and creative ability independently predicted creative achievements; they also found that these

two variables interacted: Creative ability predicted creative achievement only at higher levels of Openness. Some people, it would appear, might have the capacity to do creative work, but lack the interest.

A consideration of the cognitive and personality correlates of Openness led McCrae and Costa (1997a) to propose a conceptual definition. They argued that “Openness must be viewed in both structural and motivational terms. Openness is seen in the breadth, depth, and permeability of consciousness, and in the recurrent need to enlarge and examine experience” (p. 826).

The notion of *breadth* of consciousness is easily conveyed: Open people are interested in many things. Thomas Jefferson, for example, was a student of philosophy, religion, architecture, languages, cuisine, agriculture, industrial design, and archaeology; his personal library was so diversified that it became the core of the Library of Congress. Jean-Jacques Rousseau was not simply a social philosopher; he was also a novelist, a music critic and composer, and an amateur botanist. The association of Openness with breadth of interest is seen even within the restricted range of eminent creators. Cassandro and Simonton (2010) rated scientists, writers, and philosophers on *topical diversity*, defined as the number of distinct themes represented in their writings, and found that topical diversity was positively related to the rated Openness of their subjects. However, these wide interests are not merely intellectual: Open people travel to exotic places, experiment with mind-altering drugs,<sup>5</sup> and, like the poet Diane Ackerman, indulge all the senses (Ackerman, 1990; McCrae, 1993–1994).

*Depth* of consciousness is perhaps best discussed in terms of mental *associations*, a concept used by philosophers like John Locke and by many generations of psychologists as the central principle governing mental life. In associationist theories, thinking is organized by the connections – causal, spatial, logical, and so on – between ideas, which form a network of related thoughts and feelings. Every idea is related to other ideas through some kind of connection: Pain is associated with fire because of the past experience of being burned when touching the stove; round is associated with square because they are opposites – or because both can describe pegs; eyes are associated with ears because they are found in close spatial proximity on the face, or because both are sense organs, or words beginning with “e,” or perhaps because potatoes have eyes and corn has ears. Clearly, there are virtually unlimited ways in which ideas can be connected to each other. Depth of consciousness refers to the fact that more of these kinds of associations are available to consciousness in open than in closed people. It is this fact that makes it easier for open individuals to perform well on divergent thinking tests.

*Permeability* is a more subtle concept that refers to the fact that the organization of mental contents involves separation as well as connection. Rokeach (1960) provided a structural account of the dogmatic mind in terms of rigidly compartmentalized beliefs. One might, for example, be both a devout Christian and a ruthless capitalist, because religious ideals and business practices are two different things. Some American Leftists in the 1930s preserved their faith in Communism by simply refusing to believe that Stalin was a murderous tyrant. In the closed mind, neither internal contradictions nor disconfirming evidence need be confronted (which may be an advantage when resolute action is needed).

Individuals high in Openness, by contrast, have fewer and less rigid boundaries, leading them to more complex and differentiated moral and political beliefs (Lonky, Kaus, & Roodin, 1984). This idea of permeable boundaries between categories of

beliefs was elaborated most fully by Hartmann (1991), who extended it to include boundaries between sensory modes, emotions, and sense of self. He created a Boundary Questionnaire with such items as “I like painting or drawings with soft or blurred edges,” “At times I feel happy and sad all at once,” and “I can easily imagine myself to be someone of the opposite sex.” The total score on this scale correlated strongly with NEO Openness ( $r = .66$ ; McCrae, 1994). The permeability of consciousness in open individuals might be summarized by another of Hartmann’s items: “My thoughts blend into one another.”

The motivational aspect of Openness is seen in an insatiable curiosity about the world. Presumably this motive is deeply rooted in animal evolution; exploratory behavior has long been studied by ethologists and animal behaviorists (Lorenz, 1981). In human beings this takes the form of a quest for novelty and variety – Openness is correlated with Sensation Seeking (McCrae, 1994) – as well as a need for cognition (Cacioppo & Petty, 1982). Sometimes Openness leads to idle and superficial curiosity that might be seen in random browsing on the Internet. At other times, however, it is manifested as an intense and focused attention on a particular topic or experience, a phenomenon called *absorption* (Tellegen & Atkinson, 1974). Rousseau (1781/1953), for example, wrote that “I could have spent whole months with my crayons and pencils, without ever going out. ... It is always the same with any pursuit to which I begin to devote myself; it grows and becomes a passion, and soon I can see nothing else in the world” (p. 174). Such states of mind have been characterized as *flow* (Csikszentmihalyi, 1975), and are commonly found in artists; *mindfulness* is another related trait (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). It is perhaps his observation of this phenomenon that led Schopenhauer to assert that “only through the pure contemplation ... which becomes absorbed entirely in the object, are the [Platonic] Ideas comprehended; and the nature of *genius* consists precisely in the preeminent ability for such contemplation” (Schopenhauer, 1969, p. 185).

Open people seem to have a particular attraction to whatever lies just beyond their horizon. They value art that is evocative, suggesting more than it says. Søren Kierkegaard (1837/1936, p. 9) described a “homesickness for something unknown and far away”, and Tennyson’s Ulysses tells us that “all experience is an arch wherethrough/Gleams that untravelled world, whose margin fades/For ever and for ever when I move.”

On the other side, Kruglanski and Webster (1996) pointed out that closedness can also be motivating. They noted that some people have an intense need for closure that leads them to seize on the first answer presented and, once adopted, to freeze their views despite new information. Everyone tends to do this under stress, but some people characteristically approach the world this way. Kruglanski’s measure of need for closure is inversely related to Openness ( $r = -.42$ ; Costa & McCrae, 1998). Lacking a strong need for closure, open individuals do not feel compelled to reach conclusions, so they persist in looking for new possibilities even when they have one serviceable answer; in this way they avoid something akin to what mathematicians call the *local maxima* of a function, solutions that are relatively good, but not optimal from a broader perspective.

We now have some conception of how the mind operates in highly open people. They are drawn to a wide range of experiences and thus stock their minds with a broad array of ideas, opinions, and sentiments. They become fascinated with particular topics or activities and examine them in great depth. Because their consciousness is

permeable, with thin mental boundaries, they easily make connections – they can use their fund of information and experience, sometimes seemingly remote, to illuminate the details of specific topics. The Scottish physicist, James Clerk Maxwell, for example, was an avid horseman who loved to explore the surrounding countryside, but his appreciation of nature also stimulated his mathematical imagination: His 1870 paper “On Hills and Dales” was an important contribution to the study of topology.

### **Case Studies of Personality and Genius**

If one wishes to create a personality profile for most groups – say, firefighters – it is a relatively simple matter. One simply recruits a sample of a few hundred and asks them to complete a personality questionnaire. The group mean, plotted against general population norms, shows how much and in what ways firefighters differ from people in general, and that may help explain why they chose that job, or perhaps how their occupational experience shaped their personality.

It is not so simple in the case of geniuses. Most people who merit that term are long deceased, and the rare living exemplars are often prominent and busy individuals who cannot and perhaps should not be bothered to complete personality measures. Of course, these obstacles are not absolute. It would be possible to survey historians or other biographers who are well acquainted with individual geniuses and could provide informant ratings of their personality on well-validated personality measures, as Rubenzer and Faschingbauer (2004) have done for US Presidents. To date, that has not been done for the category of geniuses.<sup>6</sup> Cox (1926) studied character in geniuses, but did not have the benefit of modern personality assessment tools. There have also been studies of gifted children, notably those by Terman (see Chapter 23 by Duggan & Friedman) and Gross (2004), but of course, not all gifted children turn out to be geniuses.

At present, therefore, the best available data come from case studies of a handful of individuals. Such portraits can be very illuminating, but they are also potentially misleading, in part because they cannot be considered a representative sample. Case studies might show that geniuses are high in some trait only because researchers (like the present authors) may, consciously or not, choose exemplars likely to be high on that trait. Results of cases studies may thus not generalize to the whole population of geniuses. This problem would be particularly marked if the personality assessments were made by the researchers themselves; their ratings might be biased to confirm their hypotheses. In the cases we present, ratings were made by judges who were blind to the hypothesis that genius is related to Openness.

Overskeid, Grønnerød, and Simonton (2012) assessed the personality of B. F. Skinner, often considered the most eminent of 20th-century psychologists. They assembled archival material on Skinner and his life, and consulted living friends and family members. From these materials they extracted words and phrases describing his typical ways of thinking, feeling, and behaving and compiled a list of 118 descriptors. Five raters, blind to the identity of the person described, sorted these descriptors in terms of the FFM domains, and rated Skinner on each. He emerged as average in Agreeableness, relatively high in Neuroticism and Extraversion, and very high in Conscientiousness and Openness. Although behaviorism, with its denial of mentalistic constructs, might seem to appeal to concrete thinkers with limited imagination, Skinner’s radical

behaviorism appears to be an imaginative rethinking of the whole enterprise of psychology (although one that has not fared well since the cognitive revolution of the 1960s). Skinner was not simply an animal psychologist; he also wrote books on the philosophical implications of behaviorism (Skinner, 1974) and even a utopian novel, *Walden Two*.

McCrae (1996) presented a case study of the 18th-century novelist, composer, and social philosopher, Jean-Jacques Rousseau. His *Julie, or the New Heloise*, was the best-selling novel of the 18th century and (along with Goethe's *Sorrows of Young Werther*) inspired the Romantic movement; *The Social Contract* laid the philosophical foundation for the French Revolution (Durant & Durant, 1967). Rousseau's personality is well documented in many contemporary accounts and in his own *Confessions*, and McCrae obtained ratings of his traits from a political scientist and Rousseau scholar (Melzer, 1990), using a third-person version of the NEO Inventories. As befits a romantic and revolutionary figure, Rousseau's profile was extreme, with low levels of Agreeableness and Conscientiousness and a very high level of Neuroticism. In Melzer's view, Rousseau also scored in the very high range on Openness to Fantasy, Aesthetics, Feelings, Actions, and Ideas; his total Openness score was more than three standard deviations above the mean.

Rubenzler and Faschingbauer (2004) gathered NEO ratings of all the U.S. Presidents from historians and biographers. Although a few Presidents were intellectuals – Woodrow Wilson served as President of Princeton before taking political office – probably only Thomas Jefferson could be considered a genius; he was ranked first in Intellectual Brilliance in a study by Simonton (1986). Contemporary historians have mixed views on his character, chiefly because of his ambivalent attitudes toward slavery, but there seems to be no question that he was a brilliant thinker and a visionary statesman. Rubenzler and Faschingbauer obtained ratings from 11 experts, and noted that “they showed agreement only on Openness to Experience; they differed substantially on the other Big Five traits” (p. 211). The composite portrait of Jefferson thus shows a man who was near average on most facets of personality, but scored high on Openness to Fantasy, Feelings, Actions, and Values, and very high on Openness to Aesthetics and Ideas, as well as total Openness.

Figure 12.1 plots the profiles of Rousseau and Jefferson in comparison to adult men in general as seen by observers. The five personality factors are shown on the left, and the six facets of each factor are then given on the right. The numbers plotted are *T*-scores with a mean of 50 and a standard deviation of 10. It is clear at a glance that Rousseau and Jefferson have little in common; the correlation across the 30 facets is a nonsignificant  $r = .24$ , suggesting that the profiles are no more similar than chance. The differences help to explain how genius was expressed differently in these two men. Although Jefferson's near-normal profile for Neuroticism, Extraversion, Agreeableness, and Conscientiousness is compatible with a wide range of activities, Rousseau's extreme profile is not – indeed, one can hardly imagine the prickly and reclusive Rousseau serving as a diplomat or political leader. What they shared was a very high level of Openness, a style of mental life that led each to a radically new conception of the social order – and so powerful were these conceptions that they led whole nations toward democracy.

The term *genius* is usually reserved for the work of serious thinkers and artists, but it might be applied to any field of endeavor in which an individual has achieved extraordinary eminence. If one were to nominate entertainers of genius, one candidate

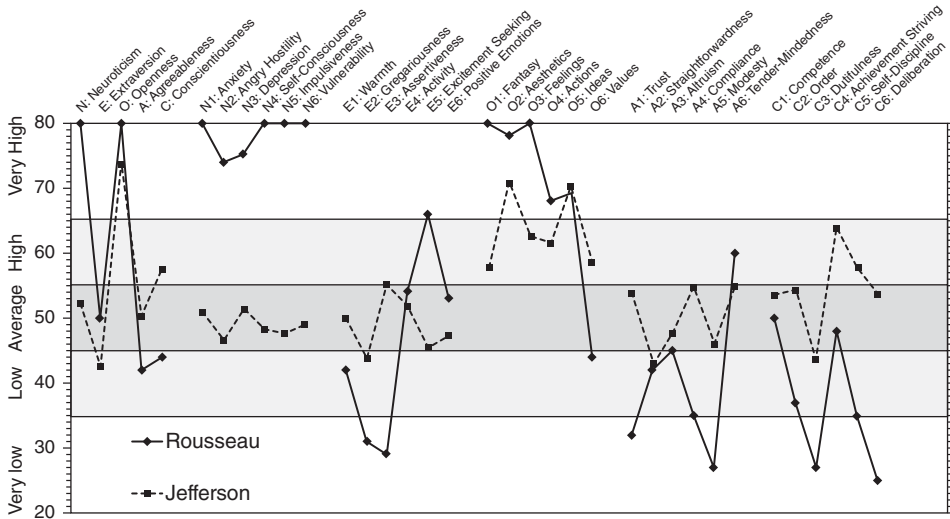


Figure 12.1 Revised NEO Personality Inventory profiles of Rousseau and Jefferson. Scores above  $T = 80$  are plotted at the top of the profile.

would surely be the legendary late-night television host, Johnny Carson. Miserandino (2007) asked undergraduates in a personality course to read the *New York Times* obituary of Carson and rate him on the five factors. They concluded that he was low in Extraversion (he was a very private person off screen) and Agreeableness, and high in Neuroticism, Conscientiousness, and Openness. As evidence of Openness, they cited improvisational acting, writing lyrics to his theme song, and his wide-ranging interests.

### A mathematical genius

We identified an eminent living mathematician we will call “AM” (not the real initials) who was willing to complete the self-report version of the NEO-PI-3. An accurate description of AM’s work is beyond the expertise of the present authors and would probably be unintelligible to most readers. Suffice it to say that it involves abstruse aspects of higher mathematics, and in particular has made major advances by finding connections between different mathematical domains that were not thought to be related. AM’s work has been recognized by the award of several prizes in mathematics.

After giving informed consent, AM completed the NEO Personality Inventory-3 (NEO-PI-3; McCrae & Costa, 2010). AM’s profile is shown in Figure 12.2, plotted against adult within-gender norms. As anticipated, AM scored very high on the Openness factor, and high or very high on four of its facets: Openness to Aesthetics, Actions, Ideas, and Values. The low score on Openness to Feelings is understandable in terms of the low levels of Neuroticism and Extraversion: Adjusted introverts have very muted emotions (Costa & McCrae, 1980). More surprising is the relatively low score on Conscientiousness. Doing mathematics is demanding work, and one might have expected higher scores, particularly on C5: Self-Discipline. It is also odd that

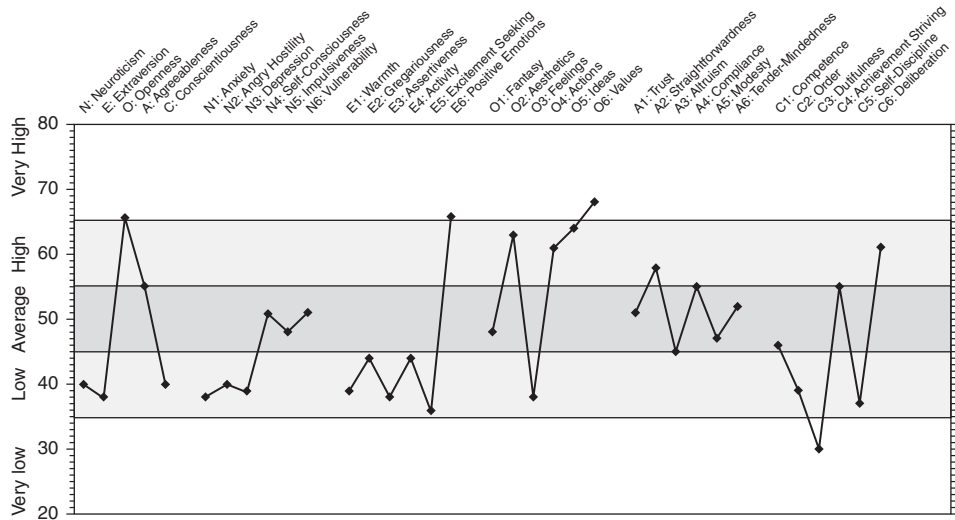


Figure 12.2 NEO Personality Inventory-3 profile of AM.

someone whose work has received international acclaim would consider him- or herself merely average in C1: Competence. Perhaps AM has particularly high standards in this area; other observers might rate AM higher in Conscientiousness.

High scores on Openness imply a cognitive style in which associations are perceived between seemingly remote ideas. It was Newton's genius to realize that the orbiting moon is actually falling toward the earth exactly as an apple does. AM's work displays the same ability to see links between apparently different fields of mathematics. Of course, constructing proofs and laying out the implications of these associations require exceptional intelligence, deep knowledge of others' contributions, and a great deal of painstaking work; but the crucial first insights are probably due to Openness.

### A musical genius

Saxophonist John William Coltrane (1926–1967) was one of the foremost musical artists of the 20th century and left behind a legacy that is one of the most “powerful and significant in the history of American and global music” (Brown, 2010, p. vii). During a career that spanned just over 10 years, he demonstrated a technical mastery of the instrument coupled with a deep emotional intensity that helped to transform the landscape of jazz music (Porter, 1998). Throughout this period, Coltrane continually broke from previously established harmonic and rhythmic structures, defining new musical ground to be explored (Porter, 1998; Schott, 2000).

His compositions and improvisational style continue to be key in the jazz idiom. During his tenures with Thelonious Monk and then Miles Davis, with whom the influential album *Kind of Blue* (1959) was released, Coltrane developed a technique that jazz critics termed “sheets of sound,” defined by fast-moving arpeggios and patterns that were played rapidly in continuation (Porter, 1998). During the late 1950s,

he began to form his own groups, and in 1960, he released the monumental *Giant Steps*; the title track is based on a very complex and fast-moving harmonic structure referred to as “Coltrane changes,” described as having “destroyed tonality by using it against itself” (Schott, 2000, p. 355).

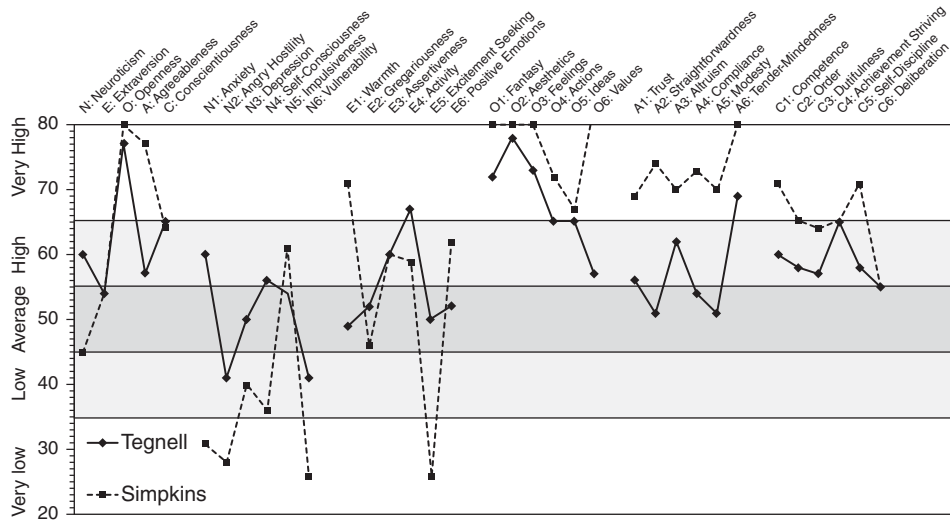
Soon after, Coltrane formed what would become known as the “classic quartet” with McCoy Tyner (piano), Jimmy Garrison (bass), and Elvin Jones (drums), and in 1964 they released their seminal recording, *A Love Supreme*, which unified both Coltrane’s musical and spiritual pursuits. The album is a four-part suite that reflects a spiritual transformation<sup>7</sup> that Coltrane underwent several years prior in 1957. The suite consists of four parts: “Acknowledgement,” “Resolution,” “Pursuance,” and “Psalm,” which taken together represent a spiritual pilgrimage in pursuit of the divine. “Psalm” is a musical narration of a poem that appeared in the liner notes, which Coltrane wrote expressing his devotion and gratitude to God (Porter, 1998). In the years that followed, the group continued to expand on these spiritual themes in albums such as *Meditations* (1966), *Ascension* (1966), and *Om* (1968). In a 1966 interview, Coltrane said,

My goal is to live the truly religious life and express it in my music. If you live it, when you play there’s no problem because the music is just part of the whole thing. To be a musician is really something. It goes very, very deep. My music is the spiritual expression of what I am – my faith, my knowledge, my being. (Zimmerman, 1967, pp. 78–79; cited in Porter, 1998, p. 232)

Until his death at the age of 40, Coltrane’s later albums were most closely associated with the avant-garde (or “free jazz”) movement, with compositions that abandoned tonality (as heard on *Ascension*; Kofsky, 1998), displayed no time signature (as with his late quartet that featured Alice Coltrane and Pharaoh Sanders; Porter, 1998), and used multiphonics and the altissimo register, which reproduced sounds reminiscent of screams and cries. In reference to these later works, Benston (1979) writes, “For in the last works of Coltrane, as in the late quartets of Beethoven, we witness genius challenging hitherto unglimped realms of imagination and expression and, in the same effort, somehow conquering them” (retrieved from [http://www.english.illinois.edu/maps/poets/g\\_1/harper/coltrane.htm](http://www.english.illinois.edu/maps/poets/g_1/harper/coltrane.htm)).

Many prominent jazz figures have been revered and written about and their music studied intently, but Coltrane and his music moved listeners on a much deeper and more personal level (Thomas, 1975). Often his listeners and devotees share a unique connection with him that extends beyond the musical realm into the spiritual (Kahn, 2002). For example, the Saint Barnabas Episcopal Church in Newark, New Jersey, includes Coltrane as a historical saint, and the services of an African Orthodox Church in San Francisco revolve around his music, particularly his *A Love Supreme* album.

We invited two experts on Coltrane, David Tegnell and Dr. C. O. Simpkins, to provide personality ratings of him. They independently completed the NEO-PI-3, blind to the hypotheses of this study. Both raters have researched Coltrane extensively over their careers, interviewing his family members and friends and investigating historical accounts of his life; they have written book-length biographies (Simpkins, 1975) and published research articles on him in academic journals (Tegnell, 2007). Figure 12.3 displays Coltrane’s personality profile. Simpkins tended to have more favorable views of Coltrane than Tegnell, but in general the two raters agreed well; the Pearson



**Figure 12.3** NEO Personality Inventory-3 profile of Coltrane as rated by two biographers. Scores above  $T = 80$  are plotted at the top of the profile.

correlation across the 30 facets was  $r = .63$ ,  $p < .001$ .<sup>8</sup> The adjusted mean of their ratings suggests that Coltrane was average on Neuroticism and Extraversion, high on Conscientiousness, and very high on Agreeableness and Openness – in fact, his Openness factor  $T$ -score of 89 is well off the chart. The influence of these traits, particularly aspects of Openness, can be seen in many aspects of his personal and musical life.

Coltrane's high scores on Openness to Ideas and Values are best demonstrated by his interest in and embrace of many religions and forms of spirituality. Although raised in a Christian household with a grandfather who was a minister (Tegnell, 2007), as an adult Coltrane adopted a belief system that accepted many different religions. He intently studied religious and spiritual texts from Christianity, Hinduism, Buddhism, Islam, and astrology (Porter 1998; Lavezzoli, 2006), and on his album *Om*, Coltrane chanted passages from the *Bhagavad Gita* (Lavezzoli, 2006) and the *Tibetan Book of the Dead* (Jenkins, 2004).

His very high ( $T = 85$ ) Openness to Aesthetics can be seen in his inclination toward jazz as his musical medium. Rentfrow and Gosling (2003) have shown that Openness is associated with a preference for complex musical styles, such as classical and jazz genres of music. Jazz is not only complex; it also prominently features improvisation (i.e., spontaneous composition over a harmonic and rhythmic sequence or form). Coltrane's groundbreaking improvisational work implies an exceptional level of Openness. He was deeply interested in the musical theory and styles of Africa and India, incorporated these elements into his music, and also studied other forms of aesthetic expression, such as architecture, language (DeVito, 2010), and visual art (Porter, 1998).

Openness to Feelings, a heightened emotional expression and vulnerability, is perhaps best heard in sounds similar to screams, shouts, and cries that he reproduced on

the saxophone. In describing Coltrane's emotional openness, historian and biographer Lewis Porter (1998) wrote,

People are so different in the way they express emotion – there are plenty of wonderful instrumentalists in the world, but that total emotional openness is very rare, because it's so dangerous, so hard to be unafraid in front of hundreds of strangers. I'm convinced that that is a key to what creates monumental art of any sort. (p. 299)

Coltrane's scores for the other domains of the FFM are also noteworthy. His systematic study and experimentation with music and his absolute dedication and commitment to practicing reflect his conscientiousness, specifically his very high scores for C1: Competence and C5: Self-discipline. However, he is also rated high in N5: Impulsiveness. Prior to his spiritual transformation in 1957, Coltrane had long battled addictions to drugs, specifically heroin. Even after he stopped taking heroin, there are accounts of his continuously eating butterscotch lifesavers, which fellow musician Steve Kuhn suggested resulted from an addictive personality (Porter, 1998). Coltrane's high Agreeableness, especially A3: Altruism and A5: Modesty, can be seen throughout his career when taking young musicians under his wing, often sharing the spotlight with them and taking on additional financial costs. As Kofsky (1998) noted, "Such magnanimity and absence of self-regard are rare in any walk of life; coming in the extremely competitive jazz milieu – where underemployment is an ever-present fact of life – they were unprecedented" (p. 427).

The correspondence between personality scores and the facts of Coltrane's life is hardly surprising: The biographers who rated him high in N5: Impulsiveness were well aware of his heroin addiction. But pointing out agreement in individual cases illustrates that standardized trait scores meaningfully capture important characteristics of real persons. It thus makes sense to undertake large-scale studies of representative samples of geniuses using instruments like the NEO Inventories. This is an obvious next step for research.

## Conclusion

The case studies we have reviewed are consistent with the idea that Openness to Experience is a key feature of the psychology of genius. Across the fields of science, literature, politics, mathematics, and music, one of the distinctive features of many exceptional contributors appears to be an attraction to new sensations and ideas combined with a characteristic way of processing information that suggests great breadth, depth, and permeability of consciousness.

Four cases were rated using the NEO Inventories, which provide a reasonably comprehensive survey of personality traits. By examining their full profiles, we can also gain some idea of whether other personality traits are also common to persons of genius. But no other traits stand out. Like some other creative writers (Jamison, 1996), Rousseau is very high in Neuroticism, but AM is low. Coltrane is high in Agreeableness, whereas Rousseau is low. Somewhat surprisingly, even high Conscientiousness is not a necessary condition for the achievement of eminence: Both Rousseau and AM score low on the factor. In fact, the facet that comes closest to a consistent pattern is C3: Dutifulness, on which three of the four score low. Only the facets, and especially the factor, of Openness are consistently high.

Is Openness, then, necessary for genius? There do appear to have been some geniuses who were closed to experience. Henry Ford, whose adoption of the assembly line revolutionized industry, much as his automobiles reshaped American culture, is a likely candidate (see <http://www.pbs.org/wgbh/americanexperience/features/transcript/henryford-transcript/>). In sharp contrast to his fellow industrialist, Andrew Carnegie, Ford (who had only an eighth-grade education) appears to have had few intellectual interests beyond business and mechanical engineering. He disparaged his son's art collection. He idealized the past and was notoriously anti-Semitic. Perhaps most telling was his attitude toward the Model T, which he considered the perfect car. He saw no need to change it and resisted the development of the Model A until the public's demand for novelty cost him too much business. Ford was surely a gifted thinker within the limited domains of his interest, and he is likely to have scored very high on Conscientiousness; perhaps this is enough to yield genius in some cases.

Perhaps, however, genius cannot be gauged entirely by the impact of a person's work, which also depends heavily on historical circumstances. Would Ford have become an important figure if he had been born in the computer age? It is easier to believe that Rousseau's talents or Jefferson's vision would have made them notable figures in any time period. Perhaps genius is a quality of mind – not a photographic memory or a seemingly magical ability to perform mental arithmetic, but an approach that takes in much of life experience, processes it deeply, and discovers new possibilities. Combined with other characteristics – exceptional intelligence, musical talent, or persistence – such Openness can lead to something astonishing.

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### Notes

- 1 In fact, Eysenck's measure of Psychoticism is related to low Agreeableness and low Conscientiousness (McCrae & Costa, 1985a), which are normally not thought to characterize geniuses.
- 2 Immanuel Kant was famous for his unvarying daily routine (low Openness to Actions), and Euler was devoutly committed to orthodox religion (low Openness to Values), but from their works we can infer that both had deep and wide intellectual interests (very high Openness to Ideas). This serves as a reminder that individuals, including geniuses, vary on the level of particular facets of Openness.
- 3 The FFM was barely discernible in the responses of a group of forager-farmers from a preliterate culture (Gurven, von Reudon, Massenkoff, Kaplan, & Lero Vie, 2013), but this may

have been because of the difficulties of meaningfully administering a Western personality questionnaire in this population.

- 4 Instead, GPA was modestly related to Conscientiousness (*Mdn*  $r = .21$ ). Neuroticism, Extraversion, and Agreeableness were generally unrelated to either SAT scores or GPA (*Mdn*  $r_s = .03, -.03, \text{ and } -.03$ , respectively).
- 5 A case in point is saxophonist John Coltrane, who was said to have used LSD in his later years to reach new and higher states of consciousness (Lavezzoli, 2006).
- 6 The Foundation for the Study of Personality in History (<http://personalityinhistory.com>) is sponsoring an ongoing Internet project that may eventually accumulate such data.
- 7 Although religious fundamentalism is linked to low Openness (Streyffeler & McNally, 1998), individuals who have “spiritual, religious, mystical, peak, transcendental, and transpersonal” experiences tend to be high in Openness (MacDonald, 2000, p. 187).
- 8 Coltrane was also rated by the second author (see Greenberg, 2010). DMG’s facet profile for Coltrane agreed with those of both Tegnell and Simpkins ( $r_s = .63, .56, p < .01$ ); his rating for Openness,  $T = 80$ , was between the two other estimates. In this case, knowing the hypotheses of the study does not seem to have biased ratings.

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